Role of Scheduling and Load Balancing Algorithms in cloud to improve the Quality of Services

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Abstract—
technology which is coming under the Ubiquitous Computing. Cloud services are delivered from the data centers located throughout the world. Cloud services and Cloud issues and challenges are described in this paper. Cloud Computing is a novice technology and it is very familiar among IT users for providing its large variety resources among its consumers. The authors, discussed various load balancing and scheduling techniques to improve QoS (Quality of Service] in cloud. This paper would benefit researchers to explore the research areas in cloud computing.

Key terms: Ubiquitous Computing, Load balancing, QoS, Scheduling.

I. Introduction

Cloud is a parallel and distributed computing. It consists of inter-connected and virtualized computers that are dynamically provisioned and unified computing resources based on service level agreements (SLA) established through negotiated between consumer and service provider [1].

Cloud computing refers to both the application delivered as a services over the internet and the hardware in the data centers that provide those services. The main goal of technologies like cluster, grid is to satisfy needs for the customers. Cloud computing customers do not own the physical infrastructure.

This paper gives overview of cloud and issues in cloud. The section II discusses deployment model and services in cloud. Section III briefly explains the review of literature. Section IV deals with issues and challenges in cloud and Section V gives the conclusion of the paper.

II. Deployment Models

A cloud can be classified as public, private, community or hybrid based on model of deployment as shown in figure 1.

Public cloud is owned by the cloud service provider and offers the high level of efficiency in sharing resources. In public cloud, users can utilize resources at anytime, anywhere with free of cost

Private cloud is a type of cloud that offers same advantages as like public cloud but it provides services to a particular organization. The public cloud serves multiple organizations whereas

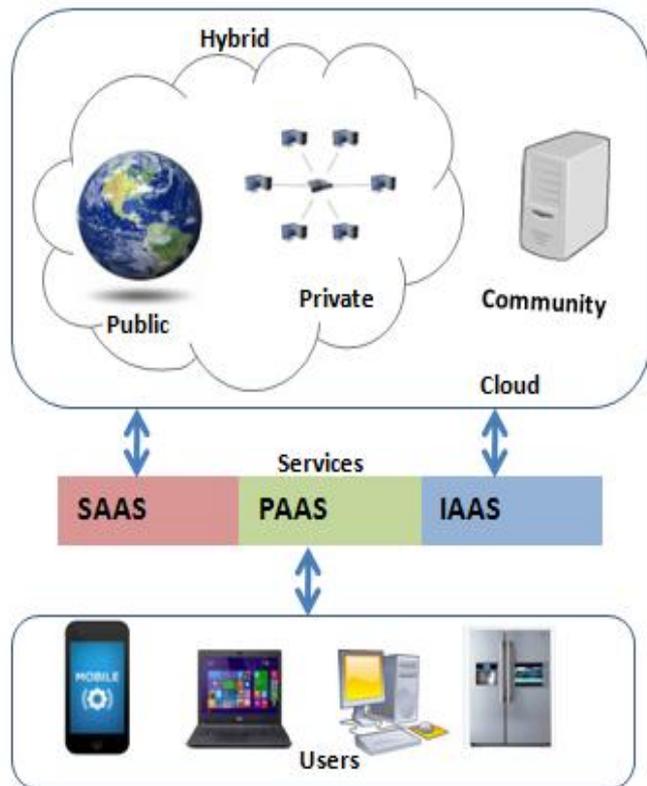private cloud serves to a single organization [2].

Figure 1. Cloud Deployment models and services

Community cloud is shared by several organizations and supports a specific community that has shared concerns (e.g., mission, security requirements).

Hybrid cloud is the combination of private and public deployment models. In a hybrid cloud specific resources are run or used in public cloud and others are used in a private cloud [3].

A. Services in cloud computing

SaaS*:* Software as a service (SaaS) is a software distribution model in which applications are hosted by a vendor or service provider and made available to customers over a network (internet) [4].

PaaS*:* Platform as a service, is referred as PaaS, it provides a platform and environment to allow developers to build applications and services. This service is hosted in the cloud and accessed by the users via internet [4].

IaaS*:* Infrastructure as a service (IaaS) provides access to computing resources in a virtualized environment on internet. It gives server space, connectivity, bandwidth, load balancers and IP addresses [4].

II.Review of Literature

Cloud computing concepts are more powerful and efficient for usage in government and private sectors. The growths of cloud and security concerns for public sectors in information technology were discussed [5]. Jasleen kaur et al., [6] stated that the deployment models and services provided were very less cost and ease to access for the IT industry. They highlighted the key concepts, architectural principles, service models, benefits as well as security issues encryption and the important concept of Rail fence technique. Spoorthy et al., [7] stated a novel security challenges which was not been fully implemented in practical simulation environment. They had explained various data storage methods, security techniques like TPA, IBE, storage security of data etc. Yoganandani et al., [8] had illustrated the issues and challenges on cloud computing with concern on the basics of security. Raj Kumar et al., [9] had proposed the security issues in the cloud. The proposed work merely emphasized on core

concepts of security in cloud. They suggested several encryption and decryption mechanisms to secure the data stored on the cloud.

Vikas Kumar et al., [10], focused their review on virtualization concepts which has one policy and law. So they degrade computing reputation and performances in cloud. So there is need to focus on privacy and security issues. Aishwarya srinivasan et al., [11] had suggested that, hybrid cloud is very useful for virtual study in an educational sector. They focused on many architectures related to educational inductions and problems implemented in a hybrid cloud environment.

O.Harfoushi et al., [12] analyzed the Security challenges in the cloud. Rashmi et al., [13] had overviewed of SaaS along with security challenges, including both traditional conventional servers and cloud data centers. They had listed several security challenges such as Information Network, resource, Cloud standards etc… and also they listed the current Saas solutions like authentication and authorization, Availability, Network Security, Data Access etc. Anurag jain et al., [14] had proposed an Architecture for cloud computing, it brings out the characteristics of cloud, and deployment model challenges of cloud computing.

Changyou Guo et al., had proposed [15] the service delivery model for cloud computing. They illustrated the challenges and key technologies such as trusted access control, lack of standards, data privacy and virtual security technology. The proposed work focused on security framework and it also includes business law and regulations. .

Farrukh Shahzed had discussed [16] the main issues of data security and privacy of information stored and processes. This paper presented the five essential characteristics of cloud computing, three cloud service models, and four cloud deployment models. From their case studies the Amazon web services and the general security measures can be understood

Dan Gonzales [17] described the vulnerability of cloud computing systems to advance persistent Threats (APT'S) is a significant concern of the government and industry, and presented cloud architecture and CCS segmentation scheme. It also mentioned, CCS node classes attack paths live VAT attack, VM manager (VMM) control compromise, confidentially and integrity. Bernd Grobauer stated [18] the vulnerability issues on cloud computing. Their work clearly detects the vulnerabilities are found in a cloud infrastructure services.

An organization or Institution are not ready to fully Trust on public cloud due to vulnerability and security issues. So they depend on a hybrid cloud environment to reduce security threats and vulnerability. So there is a need for an effective security mechanism for both cloud service providers and its consumers.

III. Issues And Challenges In Cloud Computing

Cloud computing becomes a popular technology and used by most people, many research have carried out for past years though there are still some issues in cloud computing. Security is one of the major issue associated with cloud computing. Quality of Service (QoS) is the major concern in cloud computing. The factors affecting QoS are,

- Scheduling
- Scalability
- Load Balancing
- Virtualization

i. Scheduling: Scheduling is a process of assigning resources to complete the work. It reduces the processing time. The jobs created by the user are scheduled to the service provider by the scheduler. Comparing different algorithms for the suitability, feasibility and adoptability it provides the good Quality of Services (QoS) [19]. Some of the scalability and load balancing algorithms are listed in the table 1.

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Issue	Algorithm	Task	Title	Author Name
Scheduling	Green Scheduling Algorithm	Based on decision made by a neural network predictor	Performance evaluation of a green scheduling algorithm for energy savings in cloud computing	Duy et al., [20]
	Scheduling algorithm	computational task	A task scheduling algorithm based on load balancing in cloud computing.	Fang et al., [21]
	Compared various scheduling algorithms	Find out the efficient solution	Comparison of scheduling schemes for on- demand IaaS requests	Van Do el al., [22]
	Algorithm to schedule deadline	Deadline constrained tasks in hybrid clouds	Online cost-efficient scheduling of deadline-constrained workloads on hybrid clouds.	Van den Bossche et al., [23]
	Dynamic Cloud list Scheduling (DCLS) and Dynamic Cloud Min-Min Scheduling (DCMMS)	Advanced Rearch(AR) and Best Effort	Online Optimization for scheduling preemptable tasks on IaaS cloud Systems	Jiayin Li et al., [24]
Load Balancing	Multi level Scheduling	Allocation of resources and management of applications	Dynamic resource management using virtual machine migrations.	Mishra et al., [25]
	Time utility scheduling	Resource utilization	A dynamic resource allocation method for parallel dataprocessing in cloud computing.	Kumar et al., [26]
	threshold	Dynamic resource allocation scheme	A threshold-based dynamic resource allocation scheme for cloud computing.	Lin et al., [27]
	Algorithm for resource scheduling	Energy efficient optimization methods	A resource scheduling algorithm of cloud computing based on energy efficient optimization methods	Luo et al., [28]
	LBIMM Load Balancing Improved Min-Min Scheduling	Minimize the comletion of all resources	User-priority guided Min-Min scheduling algorithm for load balanc ing in cloud computing	Chen et al., [29]

Figure 2. Scheduling and Load Balancing Architecture

ii. Scalability:

Scalability [30] is a desirable property of a system, which indicates its ability to either handle growing amounts of work in a graceful manner or its ability to improve throughput when additional resources (typically hardware) are added. A system, whose performance improves after adding hardware, proportionally to the capacity added, is said to be a scalable system. There are two types of scalability

➤ Horizontal Scalability(Scale in and out)\

➤ Vertical Scalability (Scale up and down)

Horizontal Scalability refers to the cloud's ability to connect multiple hardware or software entities and they make single unit. Vertical Scalability refers to the cloud's ability to extend the capability of existing hardware or software by adding the resources. Role of scheduler and load balancer is shown in figure 2.
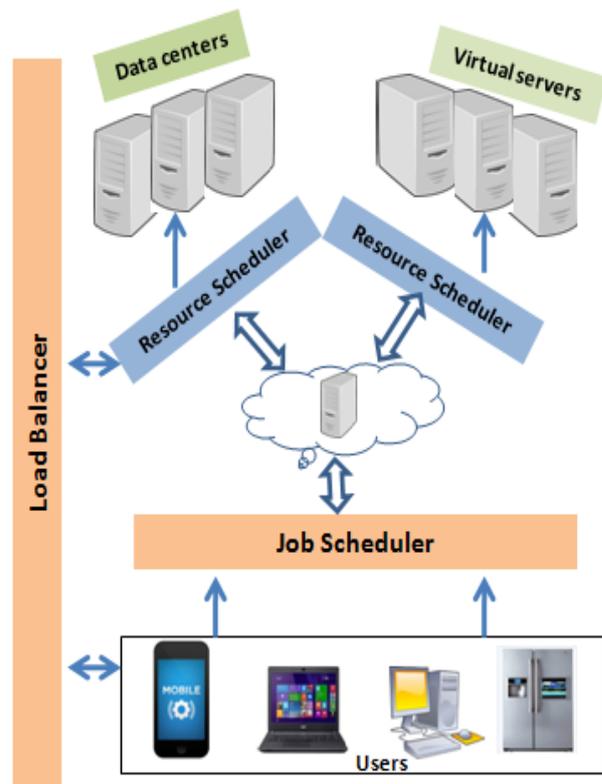

Figure 2. Scheduling and Load Balancing

iii. Load Balancing: It is the concept of distributing workloads and computing resources in cloud computing. By this we distribute the tasks by using various algorithms as explained in Table1.

iv. Virtualization: Resources are shared in different servers without having any hardware components. This technique is the creation of virtual things rather than actual version of the resources, such as servers, operating systems, storage devices, and Network devices.

IV.CONCLUSION

In this paper, the authors discussed the various usages of Cloud computing. The cloud has advantageous than traditional storage because of its availability scalability, performance, portability and its functional requirements. The various views of the literatures have been mentioned from this paper and also the scenario of challenges and issues are discussed. While cloud computing has brought various positive changes in the world of computing but still there are many other issues and challenges which need to be addressed. The QoS in cloud computing is one such research issue and challenge.

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